

Introduction:

The BFS / BFSM series electric actuators have battery backup modules for fail safe operation. The BFS series is for two position control and the BFSM series is for proportional control, both can be set to fail either to the clockwise or counter-clockwise position on loss of power. These actuators can also be configured to fail in place on loss of power with the ability to operate up to 5 cycles on loss of power. The BFSM can also be configured to fail either in place, clockwise or counter-clockwise on loss of control signal.

Storage:

1. Keep conduit entries plugged
2. Store in a dry environment
3. Keep battery disconnected when power is not present.

Battery:

The actuator is shipped with the battery disconnected. The battery should be connected after the actuator has been installed and the power has been applied. The battery should be disconnected if power is removed for an extended period of time to prolong the life of the battery. The battery has an approximate life of two years depending on environment and usage. The battery should be replaced every two years.

Manual Operation:

Pull the lever towards the handwheel to engage the manual override. If the lever does not stay engaged, pull the lever again and rotate the handwheel at the same time. The direction of output is casted on the handwheel. The manual override will automatically disengage when the electric power is turned on and the motor starts to turn.

PLEASE DO NOT TRY TO PULL OR FORCE THE LEVER TO DISENGAGE THE MANUAL OVERRIDE, THIS CAN DAMAGE THE LEVER SHEAR PIN.

Limit Switch Setting:**Closed Position**

The limit switches can be set by rotating the actuator to the closed position with the manual handwheel and rotating the top two cams clockwise until the switches just trips. Make sure you tighten the 4mm Allen head screw holding the cam after making the adjustments.

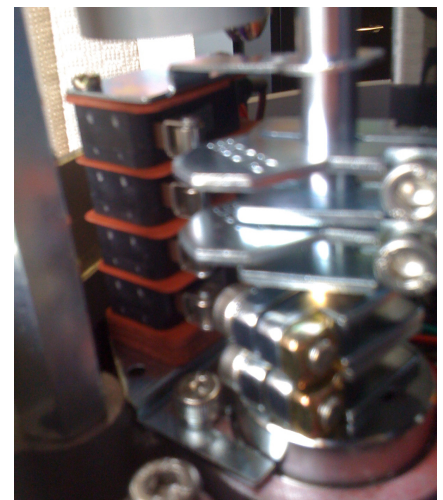
Open Position

To adjust the open position, manually rotate the actuator to the desired opened position with the manual handwheel and rotate the bottom two cams counter-clockwise until the switches just trips. Make sure you tighten the 4mm Allen head screw holding the cam after making the adjustments.

Torque Switches:

The torque switches are set by the factory for the rated torque output.

Adjustments to the torque switches can cause damage to the motor and gears.



Mechanical Stops:

The mechanical travel stops are for proper positioning during manual operation and for valve / damper protection in case of electrical malfunction.

Loosen jam nuts for both the CW and CCW travels stops. Manually operate the actuator CW until the CW limit switch trips. Then turn the CW travel stop bolt (right) clockwise until the bolt touches the worm gear. Turn the travel stop bolt counter clockwise three turns and tighten the jam nut.

Manually operate the actuator CCW until the CCW limit switch trips. Then turn the CCW travel stop bolt (left) clockwise until the bolt touches the worm gear. Turn the travel stop bolt counter clockwise three turns and tighten the jam nut.

Jamming:

If the actuator travels into a mechanical travel stop, the worm gear will jam. The actuator cannot be reversed electrically or manually until the mechanical travel stop bolt is loosened. Loosen the jam nut on the mechanical travel stop bolt, and then turn the bolt counter-clockwise three turns. The actuator now can manually operate once the pressure is off the worm gear. The mechanical travel stops should be recalibrated per the manual if jamming occurred.

Wiring:

The wiring terminations are per the wiring diagram included with each package. The actuator should be wired and grounded in accordance with local and national electrical codes. Conduit should be sealed at the actuator housing to keep water and moisture from entering the actuator. The compartment heater should be energized continuously to reduce moisture buildup.

The battery should be connected after the actuator has been installed and the power has been applied. The battery can be connected with a jumper between terminal 1 and terminal 4 (Please see wiring diagram supplied with actuator)

The BFS & BFSM series actuators are provided with a “STOP” contact. The “STOP” contact must be closed by either a switch or jumper for the actuator to operate. The actuator will not move when this contact is open.

The BFSM series actuators are also provided with an “AUTO” contact. The “AUTO” contact must be closed by either a switch or jumper for the 4-20mA input to control the actuator. The actuator can be controlled with the open and close contact when the “AUTO” contact is open.

Local Control:

Local control consists of two magnetic selector switches and 6 LED indicators. Selector switches are non-intrusive and provides perfect sealing against water.

MODE SELECTOR SWITCHES:

The selector switch on the right side of the local control decides the operating mode, and has three modes of Remote, Stop and Local. If the mode is remote, the actuator would work according to the incoming control signal (discrete or analog) from remote source.

If the mode is on stop, all command signals, regardless of local or remote is ignored and only the display status is being updated. If the mode is on local, the actuator works according to the signal generated by this local command of either close or open.




COMMAND SWITCH:

Command switch is spring return type, it will automatically return to neutral position after generating either open or close command. Two types of operation are possible based on the settings of the internal DIP switches behind the face plate.

Inching Type: Actuator works only when command signal is present.

Holding Type: Actuator continues to run until getting a stop command or trips the end of travel switch.

Display:

LED Name	Color	Description	
POWER	White	External power is present	
	Flashing	External power not present, powered by battery	
REMOTE	Blue	Local / Remote selector switch is on remote control	
BAT	Red	Battery recharging – under 50% charged	
	Blue	Battery recharging – 50% to 80% charged	
	Green	Battery is 100% charged	
FAULT	Flashing Amber	Torque switches have tripped to protect motor	
CLOSE	Green	Actuator is in the full closed position	
	Flashing	Actuator is traveling towards the closed position	
OPEN	Red	Actuator is in the full open position	
	Flashing	Actuator is traveling towards the open position	

Configuration DIP Switches:

There are (4) DIP switches on the back of the local control face plate. The (4) Allen head bolts will need to be removed to access that back of the face plate.

DIP Switch #1, “Holding / Inching

#1	
ON	HOLDING – When given a signal to change position, the actuator continues to run until a “Stop” command is provided, or reaches the end of travel limit switch.
OFF	INCHING – When given a signal to change position, the actuator continues to run only while the signal is provided. If the signal is removed, the actuator will stop movement.

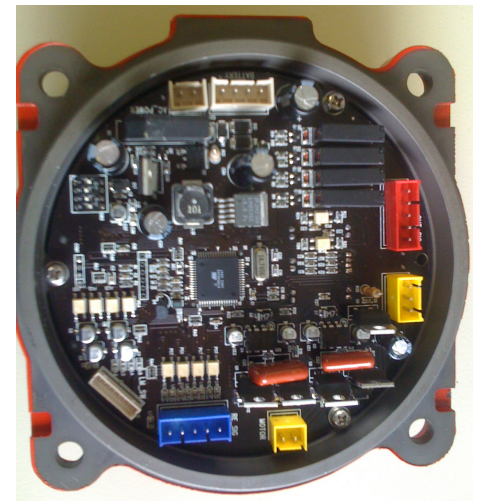
DIP Switch #2, Fault Output

#2	
ON	The contact for the fault is normally closed. The contact will open when a fault occurs.
OFF	The contact for the fault is normally open. The contact will close when a fault occurs.

DIP Switch #3 & #4, Fail Position on loss of power

#3	#4	
OFF	OFF	FAIL IN PLACE (no remote control) – The actuator will not move to a predetermined position. <u>Remote control is disabled.</u> Local control is enabled.
OFF	ON	FAIL CW – The actuator will drive to the full clockwise position on loss of power using battery power. <u>Remote control is disabled.</u> Local control is enabled.
ON	OFF	FAIL CCW – The actuator will drive to the full counter-clockwise position on loss of power using battery power. <u>Remote control is disabled.</u> Local control is enabled.
ON	ON	FAIL IN PLACE (with remote control) – The actuator will not move to a predetermined position. <u>Remote control is enabled.</u> Local control is enabled.

* Up to approximately 5 cycles may be achieved using battery power.



BFSM Proportional Control:

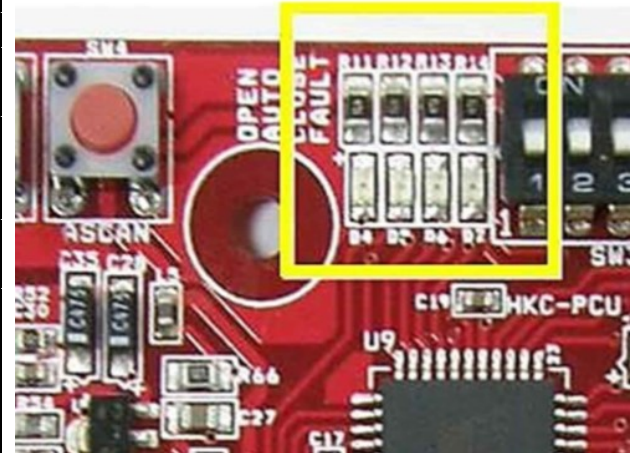
(Does not apply to the BFS series two position control)

The BFSM series actuators have a servo card for proportional control. The servo card can accept and output a few analog control signals. The servo card can also be configured for a specific fail position on loss of input signal. The servo card always uses the motor control end of travel limit switches as the starting and ending points of travel.



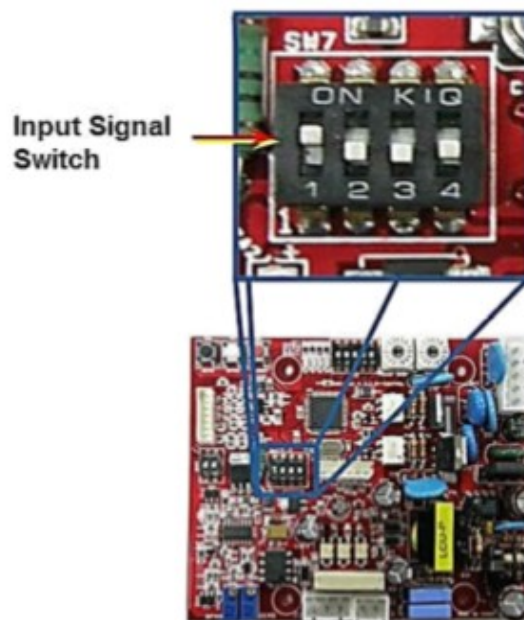
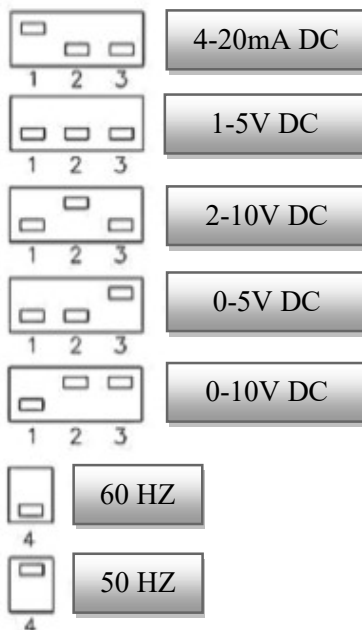
LED Signal Indication:

LED	State	Signal
Blue	On	Power is present / normal operation
	Blinking	Auto calibrate is running
Green	On	Actuator is in the full closed position
	Blinking	Actuator is traveling towards the close position
Red	On	Actuator is in the full open position
	Blinking	Actuator is traveling towards the open position
Yellow	On	Servo card is in manual mode
	Blinking	Fault indication, either: - no input signal - input polarity is wrong - feedback potentiometer set incorrectly




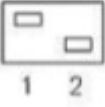
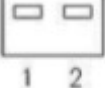
Input Signal:

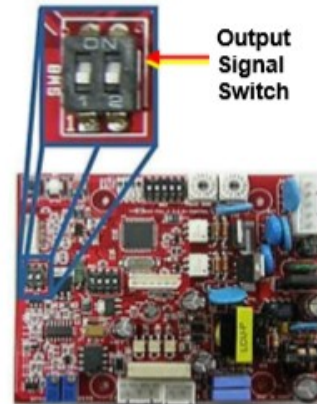
The input signal can be selected by changing the DIP switches position based on the below chart. The standard from the factory is 4-20mA DC.



Output/Feedback Signal:

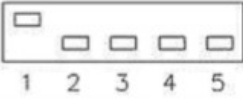
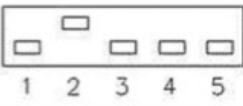
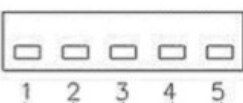
The output signal can be selected by changing the DIP switches position based on the below chart. The standard from the factory is 4-20mA DC.

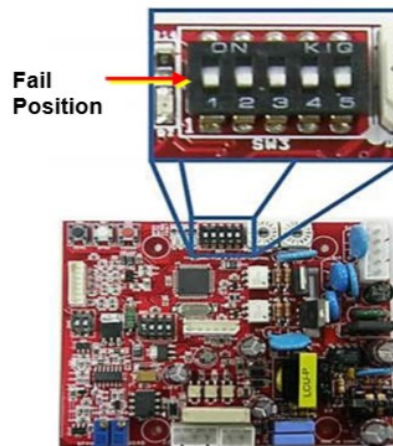
	4-20mA DC
	Input Signal Switch 1 = ON : 0-10V DC Input Signal Switch 2 = OFF : 2-10V DC
	Input Signal Switch 1 = ON : 0-5V DC Input Signal Switch 2 = ON : 1-5V DC



Fail Position:

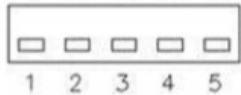
The servo card can be setup to drive the actuator to a safe position on loss of signal. The choices are fail in place, fail closed, or fail open. The fail position can be selected by changing the #1 & #2 DIP switches position based on the below chart.

	Fail Close
	Fail Open
	Fail In Place

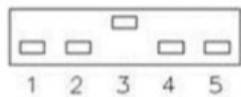


Full Open / Full Closed:

This option adjusts the full closed mA setting from 4mA to 4.3mA and the full open from 20mA to 19.7mA. This optional setting insures the actuator will travel to the full open and full closed position with a standard 4-20mA input signal. This optional feature can be turn on or off by changing the #3 DIP switch, based on the below chart.



Fully Closed = 4mA
Fully Open = 20mA



Fully Closed = 4.3mA
Fully Open = 19.7mA

Auto Calibration:

The servo card uses the motor control end of travel limit switches as the starting and ending point of travel to set the zero and span adjustments. Adjust both motor control end of travel limit switches to the desired opened and closed position.

Once the motor control end of travel limit switches are set, check power and input/output connections. Press ASCAN button to start the auto-calibration process.

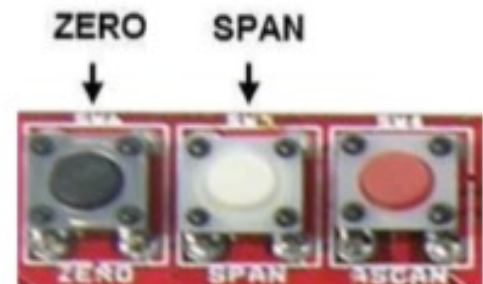
The Blue LED will blink indicating the auto calibration function is in process. The actuator will cycle back and forth setting the min and max input signal to the full open and closed positions.



Manual Operation:

The actuator can manually be operated with the ZERO and SPAN buttons. To begin manual operation, hold both ZERO and SPAN buttons simultaneously for 2 seconds. The yellow LED will be on.

ZERO will move actuator to close position. SPAN will move actuator to open position. If no operation occurs for 5 seconds, the servo card will exit Manual Operation mode and yellow LED will be off. Alternatively, Manual Operation mode can be exited by again holding both ZERO and SPAN buttons simultaneously for 2 seconds.



Custom Set-Points:

It is recommended to use the auto calibration procedure instead of the manual calibration. The manual calibration is only required when the open and closed positions are different than the standard 4mA and 20mA determined by the closed and open motor control limit switches.

It is recommended to perform the auto calibration procedure before setting custom set-points. Set DIP switch #4 ON to manually set the closed and open position. Apply the desired close position input signal and press the ZERO button. Apply the desired open position input signal and press the SPAN button. Move DIP switch #4 OFF when finished.

Set-Point	Adjustable Range	Button
Fully Closed	3-8mA DC	ZERO
Fully Open	16-21mA DC	SPAN

Note that output signal will not be affected by the custom set-point value. For example, if input range is changed to 5-19mA, the output will remain 4-20mA.

EXAMPLE:

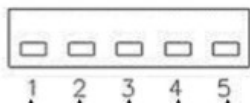
After performing the auto calibration, the actuator will travel from 0 Degr (4mA) to 90 Degr (20mA). If the desired closed position is at 10 Degr and the desired open position is at 80 Degr then follow the below procedure.

- Apply 5.78mA to the servo card, the actuator will move to 10 Degr
- Turn DIP switch # 4 on and push the zero button.
- The servo card acknowledges that position as full closed and transmits 4mA
- Turn DIP switch # 4 off
- Apply 18.22mA to the servo card, the actuator will move to 80 Degr
- Turn DIP switch # 4 on and push the span button.
- The servo card acknowledges that position as full open and transmits 20mA
- Turn DIP switch # 4 off

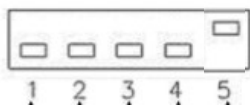
4mA will now drive the actuator to the 10 degs position and 20mA will drive the actuator to 80 Degr position.

Reverse Acting:

DIP switch # 5 is used for changing from (4mA closed / 20mA open) to (4mA open / 20mA closed). It is recommended to rerun the auto calibration after making a change to DIP switch #5.



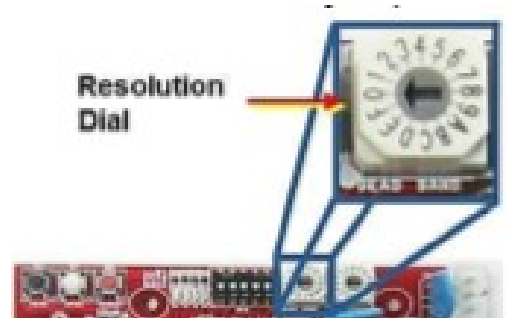
Fully Closed = 4mA
Fully Open = 20mA



Fully Closed = 20mA
Fully Open = 4mA

Resolution/Deadband:

Deadband is the area of a signal range, or band, where no action occurs (i.e. the system is dead). When the DB potentiometer is turned clockwise the deadband gets larger and requires a larger input signal change to get movement. When a tighter control is required (finer resolution) turn the DB potentiometer counter-clockwise. Be careful when turning counter-clockwise to avoid hunting. If hunting occurs, it can cause premature actuator failure. Factory default is #4 (0.31mA). It will take approximately 0.31mA increase / decrease to get movement.



Dial	0	1	2	3	4	5	6	7
mA DC	0.063	0.125	0.188	0.250	0.313	0.375	0.438	0.500
Dial	8	9	A	B	C	D	E	F
mA DC	0.563	0.625	0.688	0.750	0.813	0.875	0.938	1.000

Delay Time:

The Delay Time prevents movement unless a change in input signal is maintained beyond the set time. This setting is to prevent continuous movement due to noise in the incoming signal. When the Time potentiometer is turned clockwise the delay gets longer. Factory default is #4 (800msec).

Dial	0	1	2	3	4	5	6	7
sec.	0.05	0.2	0.4	0.6	0.8	2.5	3.0	3.5
Dial	8	9	A	B	C	D	E	F
sec.	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5



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